
Better, faster stem cell reprogramming

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A group at the Harvard Stem Cell Institute led by Derrick Rossi has taken a big step toward a holy grail in stem cell science - reprogramming skin cells to resemble embryonic stem cells without viruses (Cell Stem Cell paper). The new technique uses transient RNA to reprogram the cells into what they are calling RiPS cells (for RNA induced Pluripotent Stem Cells)

Reprogrammed human iPS cells were first generated in 2007 by Shinya Yamanaka of the Gladstone Institutes and Kyoto University, but his approach involved using a virus to insert four genes permanently into the cells. A Harvard press release describes the problems with the initial approach:

“ First, the use of the integrating viruses raised the very real possibility that cancers might inadvertently be triggered; and second, inserting the genes into the genome could lead to changes that would alter the properties of the resulting iPS cells so that they would not be identical to human embryonic stem cells.

Since that first discovery, scientists around the globe and in California have been working toward techniques that avoid viruses and don't permanently alter cell's DNA. (Here is a list of CIRM grants focused on new ways of generating iPS cells.) Rossi describes the benefits of his approach:

“ "Gene therapy trials unfortunately taught us the danger in leaving viruses in the genome as some patients developed cancers that were driven by the integrated viruses. So when one thinks about strategies for regenerative medicine, you need to envisage utilizing cells whose genome has not been breached. We believe that utilizing RNA to generate transplantable cells and tissues is a ideal solution because, to the best of our knowledge, RNA is completely non-integrative."

What's still unclear is how similar these iPS cells are to their embryonic counterparts. Several recent papers have found that iPS cells can differ significantly from embryonic stem cells in their ability to generate all tissues. (We have blog entries on those papers here, here and here.)

A.A.

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